Super-Resolution Generative Adversarial Network for Weather Radar Images

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Super-Resolution Generative Adversarial Networks (SRGANs), since their inception a few years ago, have proven to be very useful and effective techniques, specifically for video and image processing. Data and computer scientists and engineers have been utilizing this technology within many different fields to enhance the quality of video and image datasets and, thus, enhance both the quality and quantity of information procured from that data. SRGANs focus primarily on generating pseudo-high-resolution images (referred to as super-resolution) from low-resolution input data by training the network on low-resolution and high-resolution image pairs. This paper aims to utilize the image processing and generating capabilities of SRGANs within the scope of generating super-resolution weather radar scans.

Specifically, this presentation focuses on developing a proof-of-concept SRGAN model for the purpose of inferring physically-realistic, high-resolution radar scans from low-resolution scans. With the technological capabilities of today, a weather radar must scan relatively slowly in order to collect high-resolution polarimetric observations. Slow scan rates improve the quality of the data collected overall; however, slow scanning decreases the amount of data that can be collected. Furthermore, slow scan rates increase the potential for motion artifacts within the scan of the meterological volume, especially as the storm moves faster. This research explores the capabilities and validity of training an SRGAN on low-resolution weather radar plan position indicator (PPI) and range height indicator (RHI) images using a high scan rate and generating super-resolution RHI images of the same quality as the original high-resolution scans.

The results of the SRGAN's performance on generating super-resolved weather radar scans will be quantified, comparing between the super-resolution scans and their original high-resolution counterparts.